



Badger Meter

Electronic Preset Meter

Model EPM-3, RF 2.4 GHz



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SAFETY

WARNING

Explosion and Fire Hazards

Improper grounding, poor ventilation, open flames or sparks can cause a hazardous condition and result in an explosion or fire and cause serious injury.

- Be sure the fluid system is properly grounded. See your pump instruction manual for details.
- If there is static sparking or if you feel an electric shock while using the meter, stop dispensing immediately. Identify and correct the problem before continuing.
- Provide fresh air ventilation. This will avoid the buildup of fumes from the fluid being dispensed.
- Do not smoke while dispensing flammable fluids.
- Keep the dispensing area free of debris including solvents, rags and spilled gasoline.

WARNING

Meter Hazards

Equipment misuse can cause the meter to rupture or malfunction and cause serious injury.

- This equipment is for professional use only.
- Read all instructions, tags and labels before operating the equipment.
- Use the equipment only for its intended purpose.
- Do **NOT** modify or alter the equipment.
- Do **NOT** leave equipment unattended while dispensing.
- Check equipment daily. Repair or replace worn or damaged parts immediately.
- Do **NOT** exceed the maximum working pressure level of the lowest rated system component.
- Use only extensions and nozzles that are designed for use with this equipment.
- Use only fluids and solvents that are compatible with the equipment. Read all fluid and solvent manufacturer's warnings.
- Tighten all fluid connections before operating this equipment.
- Do **NOT** stop or deflect leaks with hands, body, gloves or rags.
- Do **NOT** dispense towards any person or any part of the body.
- Do **NOT** place hands or fingers over the end of or into the dispense valve.
- Comply with all local, state, and federal fire, electrical and safety regulations.
- Use of this product in a manner other than specified in this manual may result in impaired operation or damage to equipment.

ELECTRONIC PRESET METER DESCRIPTION

Disclaimer

The user/purchaser is expected to read and understand the information provided in this manual, follow any listed Safety Precautions and Instructions and keep this manual with the equipment for future reference.

The information in this manual has been carefully checked and is believed to be entirely reliable and consistent with the product described. However, no responsibility is assumed for inaccuracies, nor does Badger Meter Inc. assume any liability arising out of the application and use of the equipment described.

Product Identification Information

Record the product identification numbers from the nameplate here.

Model Number _____

Serial Number _____

Tag Number _____ (if applicable)

Certification

- Contains FCC ID: S4GEM35XB
- Contains IC: 8735A-EM35XB
- FCC CERTIFIED, PART 15, SUB-PART C
- CE0681 EC-R&TTE Certified

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

WARNING

To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operations at closer distances than this are not recommended.

OPERATION

The Electronic Preset Meter RF3 (EPM RF3) is equipped with RF (radio frequency) communications to communicate with a fluid management system keypad to get authorization and dispense information. This is referred to in the manual as the RF Mode.

The meter can also be run as a standard EPM. This is referred to in the manual as the EPM Mode. This is intended for start-up purposes or when the fluid management system is not in use.

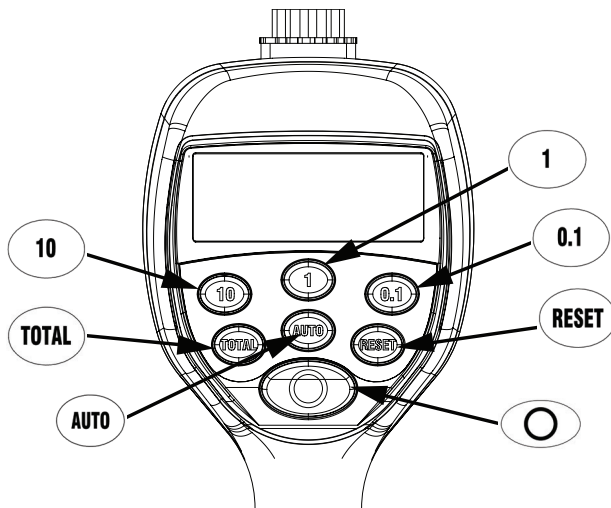
Once a work order has been entered at the keypad, the operator simply pushes the **RESET** button on the meter to start communications between the meter and the keypad. The meter receives authorization from the keypad to unlock and the dispense batch quantity. When the trigger is pulled the preset dispense batch quantity dispenses.

The meter automatically shuts off when the dispense batch quantity has been reached.

A Topoff feature allows additional fluid to be dispensed and tracked after the batch quantity has been dispensed.

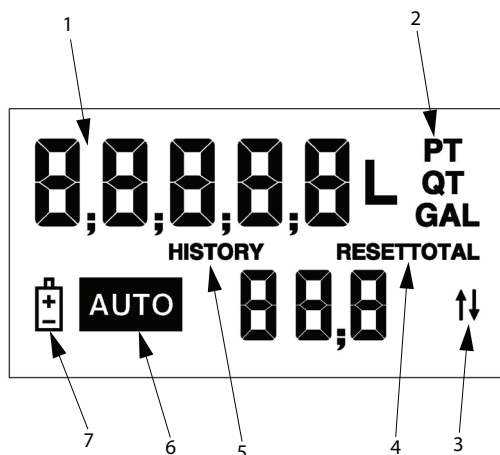
Upon completion of the dispense, the operator presses the **RESET** button. The meter then locks, prohibiting any unauthorized dispense of fluid to occur, and the dispense quantity is sent to the keypad.

Meter Buttons



- 10, 1, 0.1** Used to enter the dispense Batch quantity when in the EPM Mode. These buttons are **NOT** used in RF Mode.
- TOTAL** Used to display the accumulated total of fluid dispensed, as well as the re-settable total.
- AUTO** Used to enter and exit the manual or batch mode when in EPM mode. This button is **NOT** used in RF mode.
- RESET**
 - Used to initiate RF communications from the meter to the Keypad.
 - Used in EPM mode to clear the previous batch.
 - Used to reset the re-settable total dispensed while pressing the TOTAL button.
- SHUTOFF or STOP** Used to stop the flow through an Emergency Override.

LCD Display



- 1** Displays resettable total, accumulated total and scale factor
- 2** Displays unit of measure
- 3** Arrows flash when RF communication is in progress with the keypad
- 4** Preset Batch quantity
- 5** History Icon
- 6** AUTO is an indicator of being in EPM mode
- 7** Low Battery Icon

METER INSTALLATION

Relieve System Pressure

1. Turn off the power supply to the pump or close the shutoff valve.
2. Dispense any fluid in the system into a waste container by opening the meter(s).
3. Open all bleed-type master air valves and fluid meter(s) in the system.
4. Leave the meter(s) open until ready to pressurize the system.

WARNING

Pressurized Equipment

This equipment stays pressurized until the pressure is manually relieved. To reduce the risk of injury from fluid spray from the meter follow the Pressure Relief Procedures when you:

- Are instructed to relieve pressure
- Stop dispensing
- Check, clean, or service any system equipment
- Clean or install nozzles

Grounding

Grounding reduces the risk of static sparking. Ground all system components according to local, state, and federal codes. Consult the pump user's manual and other system components to ground the following:

- **Pump:** follow manufacturer's recommendations
- **Air and Fluid Hoses:** use only grounded hoses
- **Air Compressor:** follow manufacturers recommendations
- **Fluid Supply Container:** follow the local code

WARNING

Possible Explosion and Fire

Movement of fluids through the dispensing system creates static electricity. Static electricity can cause volatile fumes resulting in an explosion and fire. The dispensing system must be grounded.

Flushing Procedure

NOTE: If the system has multiple dispense positions, begin at the position farthest from the pump and move towards the pump.

CAUTION

If this installation is new or if the fluid in the lines is contaminated, flush the system before installing the meter(s).

1. Close fluid dispense valves at every position.
2. Once the main fluid outlet valve at the pump is closed, the air pressure to the pump motor is properly adjusted and the air valve is opened.
3. Slowly open the main fluid valve.
4. Place the hose end in a waste container. Make sure hose is secure so no fluid leaks during flushing.
5. Slowly open the dispense valve and allow enough oil to pass through it to ensure that the system is clean.
6. Close the valve and repeat for all dispense positions.

Apply Meter to Hose

Close the drain valve before starting this procedure.



1. Attach a swivel to the meter. Apply thread sealant to the male end of hose. Recommended sealant is Loctite® 243.



2. Insert the metal end of the hose into the swivel. Tighten completely with an open ended, adjustable, wrench.

NOTE: The threaded end of the meter always has female threads. The metal end of the hose must have male threads.
Apply thread sealant, Loctite® 243, or equivalent, to the male end.
The inlet and outlet swivel connections are either 1/2" NPT or 1/2" BSPP, depending on meter model.

Apply Nozzle to Meter



1. On the opposite end, apply sealant to the end of the nozzle. Recommended sealant is Loctite® 243.



2. Thread the nozzle onto the meter. Screw it in tightly with an open ended, adjustable, wrench.
3. Open all dispense position shut-off valves. Start the pump to pressurize the system.
4. Before use, to ensure accuracy, purge all air from the fluid lines and dispense valve(s).

METER OPERATION, RF MODE

Connecting to an FMS Network

When the meter is first installed, it must be attached to the network with the keypad powered ON. Also, when the keypad is replaced, the meter must be reconnected.

1. Press and hold the **10** key.
2. While holding down the 10 key, press and release the **RESET** button.

The meter will then search for and connect to the network.

When the battery pack is attached to the meter, it automatically enters the RF Mode. The trigger is in the locked-out position. No fluid can be dispensed by the meter until a dispense order is received from the keypad.



Arrows



Batch Quantity

1. Pressing the meter **RESET** button causes communication to occur between the meter and the keypad.
Two arrows in the lower right hand corner of the meter screen flash. This indicates communication is in progress between the meter and keypad.
2. When the communication is complete the trigger unlocks and the batch quantity is displayed.
3. Pull the trigger to the full, up, position to begin the fluid flow.
 - The solenoid valve automatically locks the dispensing valve in the full open position. The trigger falls back to the closed position.
 - It is not necessary to continue to hold the trigger.
 - After the batch quantity is dispensed, the flow automatically shuts off.

⚠ CAUTION

Do NOT press the RESET button before topping off.

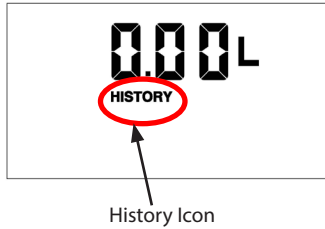
If the RESET button is pressed, the meter returns to a locked-out position and does not allow additional fluid to be dispensed until a valid dispense order is received from the RF system.

4. You have the option to top off the tank after the batch quantity has been dispensed.
 - a. To top off, pull the trigger to begin the flow.
 - b. Release the trigger when the desired amount has been dispensed.
5. Press the **RESET** button when finished to complete the dispense order.
 - a. The total quantity dispensed is transmitted to the RF system.
 - b. The meter returns to the locked position.
 - c. The meter is now ready to receive another dispense order from the RF system.

NOTE: If the original communication fails, the meter automatically attempts to communicate with the RF system by resending the Dispense Result three times, 30 seconds apart.

6. If the meter is unable to communicate a dispense result, the History icon lights.

History Icon



The History icon indicates there is dispense result information that has not been communicated to the keypad to complete a work order.

To send the dispense result information to the keypad, press the **RESET** button to initiate communication.

Error Codes

The meter has several Error Codes that may display. These provide indication, at the meter, that there is an error in communication between the meter and keypad.

F01	The meter radio is not working.
	To clear the error, press the RESET button on the meter.
F02	The meter is not configured to a keypad.
	To clear the error code, press the RESET button on the meter.
	Verify that the meter radio address is configured properly.
F03	System busy.
	To clear the error, press the RESET button on the meter.
F08	Meter lost connection to network.
	Out of range—network connection lost.
	Keypad not powered.
	Meter moved out of range of keypad.
F09	Meter not connected to a network.
	First time being powered up.
	Network selected is not available.
SF0 (Scale Factor 0)	The Scale Factor setting for the meter is set to 0.000.
	To input a valid Scale Factor for the meter follow the instructions in the Change Factory Settings section of this manual.
All other Error Codes	Are for factory purposes only.
	To clear the meter, press RESET .

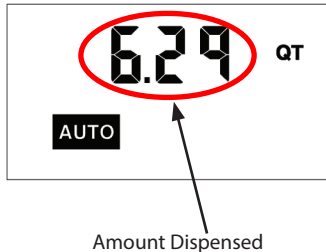
METER OPERATION, EPM MODE

The meter can be put in EPM Mode for startup purposes by entering the Manual Mode key sequence. Consult the factory for the sequence.

The AUTO icon displays, indicating the meter is in the EPM Mode. The solenoid valve unlocks and the meter can now be used as a Standard Preset Batch Meter.

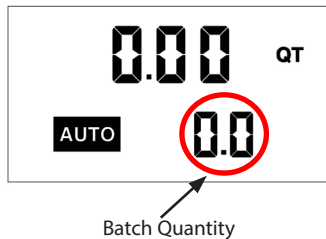
NOTE: The **AUTO** button is used to toggle between Manual Mode and Batch Mode.

EPM Manual Mode



1. Pull the trigger to begin the flow.
2. The display shows the amount dispensed.
3. When the desired amount has been dispensed, release the trigger to stop the flow.
4. Press the **RESET** button once to reset the counter display to zero.

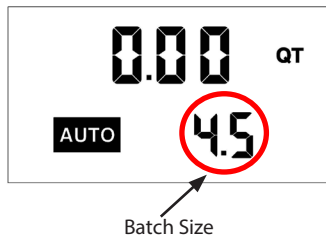
EPM Batch Mode



To enter the Batch Mode from the Manual Mode, press the **AUTO** button.

When in the Batch Mode, the batch quantity displays in the lower right-hand corner of the screen.

The meter is now in Batch Mode.



1. Change the batch size by pressing the **10**, **1** and/or **0.1** buttons.
 - a. Press the **10** button to increase the batch amount in increments of 10 units.
 - b. Press the **1** button to increase the batch amount in increments of 1 unit.
 - c. Press the **0.1** button to increase the batch amount in increments of 0.1 units.
2. Pull the trigger to begin the flow.

The meter solenoid valve automatically locks the dispensing valve in the full open position. The trigger falls back to the closed position.

⚠ CAUTION

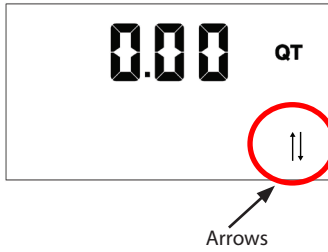
The meter always locks in the maximum open position.

After the batch quantity is dispensed, the flow automatically shuts off.

NOTE: For RF and BATCH programming, the meter automatically shuts off if the trigger is pulled and the meter does not sense any flow.

Also, in case of an emergency or to interrupt a batch, the meter is equipped with an Emergency Override. (Refer to the "Emergency Override" on page 14 section of this manual.)

Return to RF Mode



To return to the RF Mode from the EPM Mode:

1. If the batch quantity on the display is not zero, press the **RESET** button to zero the display.
2. Press the **RESET** button with a zero batch quantity on the display. You'll see the flashing arrows indicating the meter is communicating with the RF System.
3. When communication is complete, the meter returns to the RF Mode and the trigger locks.

To manually reset the meter to the RF Mode:

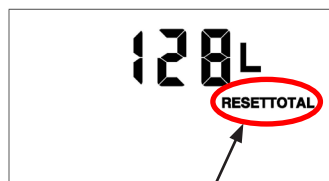
1. If the batch quantity on the display is not zero, press the **RESET** button to zero the display.
2. Re-enter the Manual Mode key sequence.

OPERATING MODE FUNCTIONS

These functions operate the same in RF Mode and EPM Mode.

Resettable/Accumulated Totals

The meter has two flow totalizers. One is Resettable Total the other is Accumulated Total.



Resettable Total

1. Press and hold the **TOTAL** button to see the *Accumulated Total*.
2. Continue holding the **TOTAL** button for three seconds to see the *Resettable Total*.
RESETTOTAL displays the total fluid dispensed since the *Resettable Total* was last set back to zero.
3. Press the **RESET** button while viewing *RESETTOTAL* to set it back to zero.
4. Release the **TOTAL** button to return to the operating display.

NOTE: The Accumulated Total cannot be reset unless the you change the unit setting from English units to metric units or from metric to English units. (Refer to the Change Factory Settings, Change Unit of Measure section of this manual).

Emergency Override

In case of an emergency or to interrupt a batch, the meter is equipped with an Emergency Override.

1. Press the red **O** button to activate the Emergency Override.
The override closes the valve, immediately stopping fluid flow.
2. Batching can continue after an Emergency Override by pulling up on the trigger.

CALCULATING THE SCALE FACTOR

A Scale Factor is a number used to adjust meter accuracy. The Scale Factor is set at the factory using motor oil with a viscosity of 10W.

The primary use for Scale Factor recalibration is to batch fluids with different viscosities. If the fluid has a lower viscosity, more fluid can slip past the meter gears without being detected. Changing the Scale Factor adjusts the meter to compensate for the loss.

The meter multiplies each pulse by the Scale Factor number to correct the accuracy when it converts to the specified units. The reading is then always correct.

For an approximate Scale Factor for fluids of different viscosities, consult the charts on the next page.

NOTE: The meter's original Scale Factor was written on the trigger when it was calibrated at the factory. It may have been revised after field installation. **Use the Scale Factor showing on the display, not the one written on the trigger.**

IMPORTANT

Changing the Scale Factor changes the accuracy of the meter, potentially causing over-dispensing or under-dispensing of the liquid.

Viewing the Current Scale Factor

To view the current Scale Factor, press and hold the **TOTAL** button and the **AUTO** button at the same time.

Absolute Scale Factor

For absolute Scale Factor, perform this test:

1. Run a measured amount of fluid through the meter.
2. If the meter delivers 4.20 quarts and the display shows only 4.00 quarts, then the Scale Factor needs to be adjusted.
3. Divide what the meter delivered (4.20) by what the display shows (4.00). You get an error factor of (1.05).

The existing Scale Factor is 1.0123.

4. To calculate a new factor: $1.0123 \text{ (existing Scale Factor)} \times 1.05 \text{ (error factor)} = 1.0629 \text{ (new Scale Factor)}$.
5. Enter that number as described in the Change Scale Factor section of this manual.

NOTE: Use the Scale Factor showing on the display, not one written on the trigger.

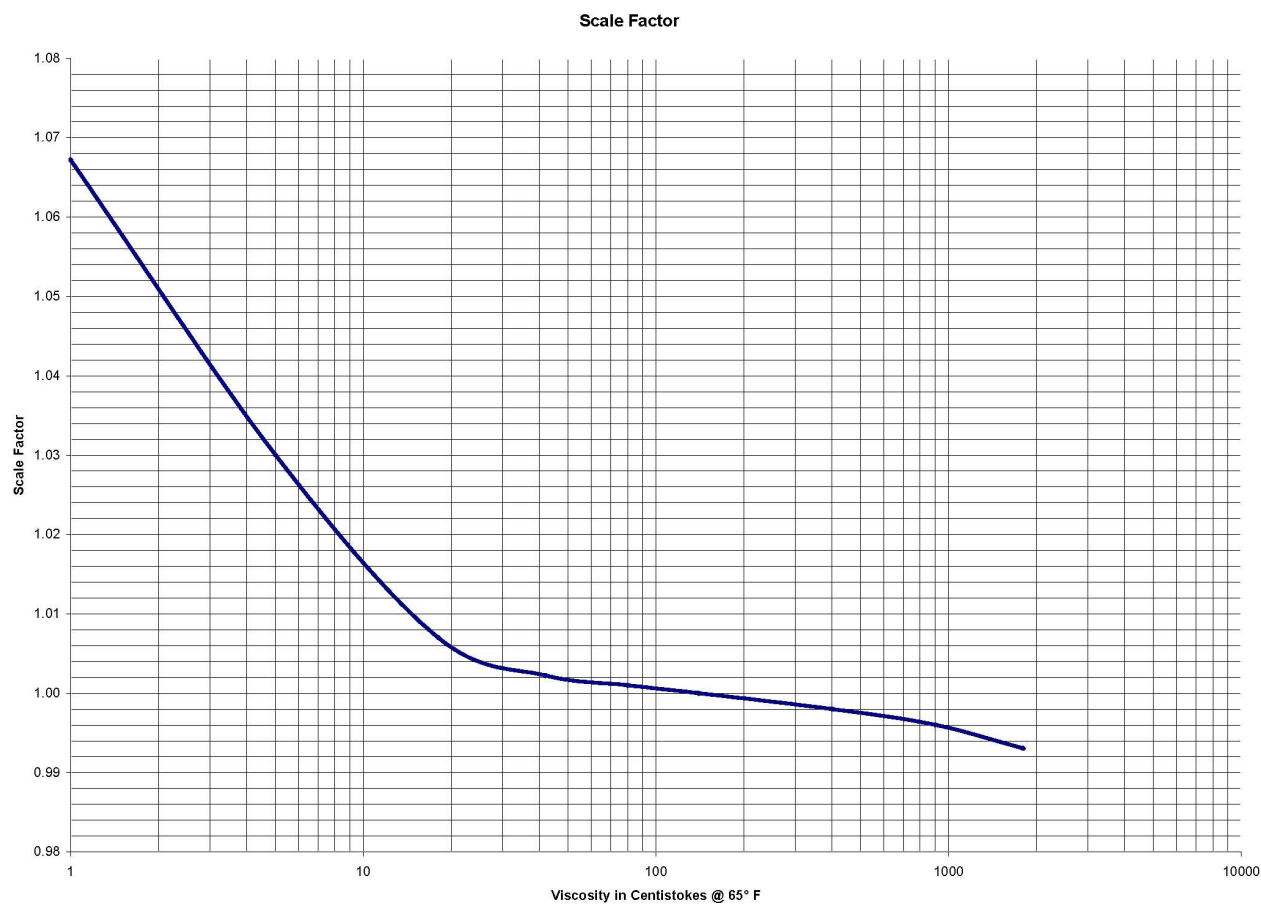


Figure 6: Chart of Approximate Scale Factors for Fluids of Different Viscosities

Fluid	Viscosity	Scale Factor
Water/Anti-Freeze	5	1.044
Anti-Freeze	18	1.007
Brake Fluid	42	1.004
ATF	80	1.002
10W	140	1.000
80W-90	450	0.999
140W	1800	0.993

Table 2: Samples of Fluids, Viscosities and Scale Factors

CHANGING FACTORY SETTINGS

Each meter is calibrated at the factory for use with motor oil (refer to the Change Scale Factor section of this manual). The Unit of Measure is also selected prior to shipment.

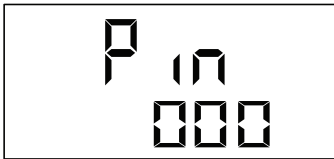
Verifying Firmware Version

To check the firmware version and code checksum, press and hold the **TOTAL** and **1** buttons at the same time.

The last two digits on the lower right are the firmware version.

Using the Programming Feature

Use the Programming feature to change the factory settings:



Push the **AUTO** and **TOTAL** buttons at the same time and hold for 2 seconds to bring up the *Program PIN* screen. To enter your PIN:

1. Press and hold the **10** button to select first digit of PIN.
2. Press and hold the **1** button to select second digit of PIN.
3. Press and hold the **0.1** button to select third digit of PIN.
4. If necessary, hold down the **TOTAL** key and press **10**, **1**, or **0.1** to decrement a PIN digit.
5. Press **RESET** to confirm PIN and enter the programming mode with *Scale Factor and Unit of Measure* screen displayed.
6. Push and hold **AUTO** and **TOTAL** for 2 seconds to exit the programming mode.

Changing the Unit of Measure

The meter has four Units of Measure:

- Pint (PT)
- Quart (QT)
- Gallon (GAL)
- Liter (L)

⚠ CAUTION

Changing the Unit of Measure from metric to English or from English to metric clears the Resettable Total and the Accumulated Total.



The current Unit of Measure is flashing when you enter the Programming Mode. To change the Unit of Measure:

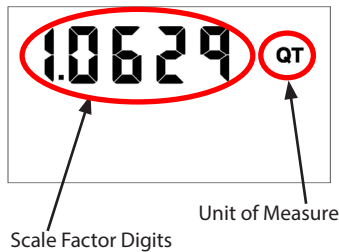
1. Press and hold the **TOTAL** button until the Unit of Measure you want is displayed.
2. Press the **RESET** button to save your selection.
3. If you select **L** (Liters), the decimal point begins to flash. Press the **TOTAL** button to change the decimal point to either a period or a comma.
4. If no Scale Factor changes are necessary, press and hold the **TOTAL** and **AUTO** buttons until the display flashes three times, then goes blank
OR
Press the **RESET** button to advance to the *EPM Manual Mode Enable* screen.

Changing the Scale Factor

IMPORTANT

Changing the Scale Factor changes the accuracy of the meter, potentially causing over-dispensing or under-dispensing of the liquid. This has the potential to cause a mechanical breakdown.

Scale Factor Digits



1. Press the **RESET** button to advance through the Scale Factor digits.
2. Press the **TOTAL** button to change the selected number.

NOTE: All digits can be scrolled between 0 and 9 except the first. It can only be scrolled from 0 to 1 or from 1 to 0.

3. Press the **RESET** button advance to the next number in Scale Factor.
4. Repeat steps 2 and 3 for all five digits in Scale Factor.
5. If no Scale Factor changes are necessary, press and hold the **TOTAL** and **AUTO** buttons until the display flashes three times, then goes blank
OR
Press the **RESET** button to advance to the *EPM Manual Mode Enable* screen.

Verifying Changes

Press and hold down the **TOTAL** and **AUTO** buttons at the same time to verify that the Scale Factor is correct.

Enabling or Disabling the EPM (Manual) Mode



To enable or disable the EPM mode:

1. Press the **RESET** button to advance to the AUTO icon on the display. There will be no other icons flashing on the display.

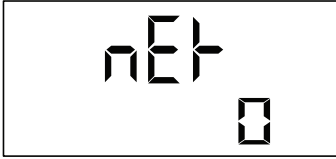


2. Press the **AUTO** button to toggle the AUTO icon on and off.

When the icon is turned on the meter can be put in EPM mode through the special key sequence on the meter keypad. When the AUTO icon is turned off the key sequence is disabled and the meter cannot be put in EPM mode.

3. Press the **RESET** button to advance to the *Network Program* screen.

Network Program



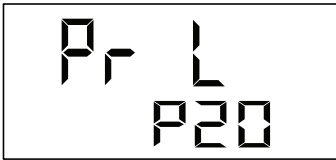
The Radio Network is used to differentiate multiple FMS networks. For standard installations the default setting of zero will not need to be changed.

The Network setting must be between 0 and 255. To change the network setting:

1. Press **1** to increment network setting or press **0.1** to decrement network setting.
2. Press **RESET** to advance to the *Power Level Display* screen.

NOTE: When NOT in programming mode, you can view the Radio Network by holding down the **TOTAL** button while pressing the **10** button.

Power Level Display



1. The radio power level is set at the factory. The display is for validation purposes only.
2. Press **RESET** to return to Scale Factor and Unit of Measure screen.

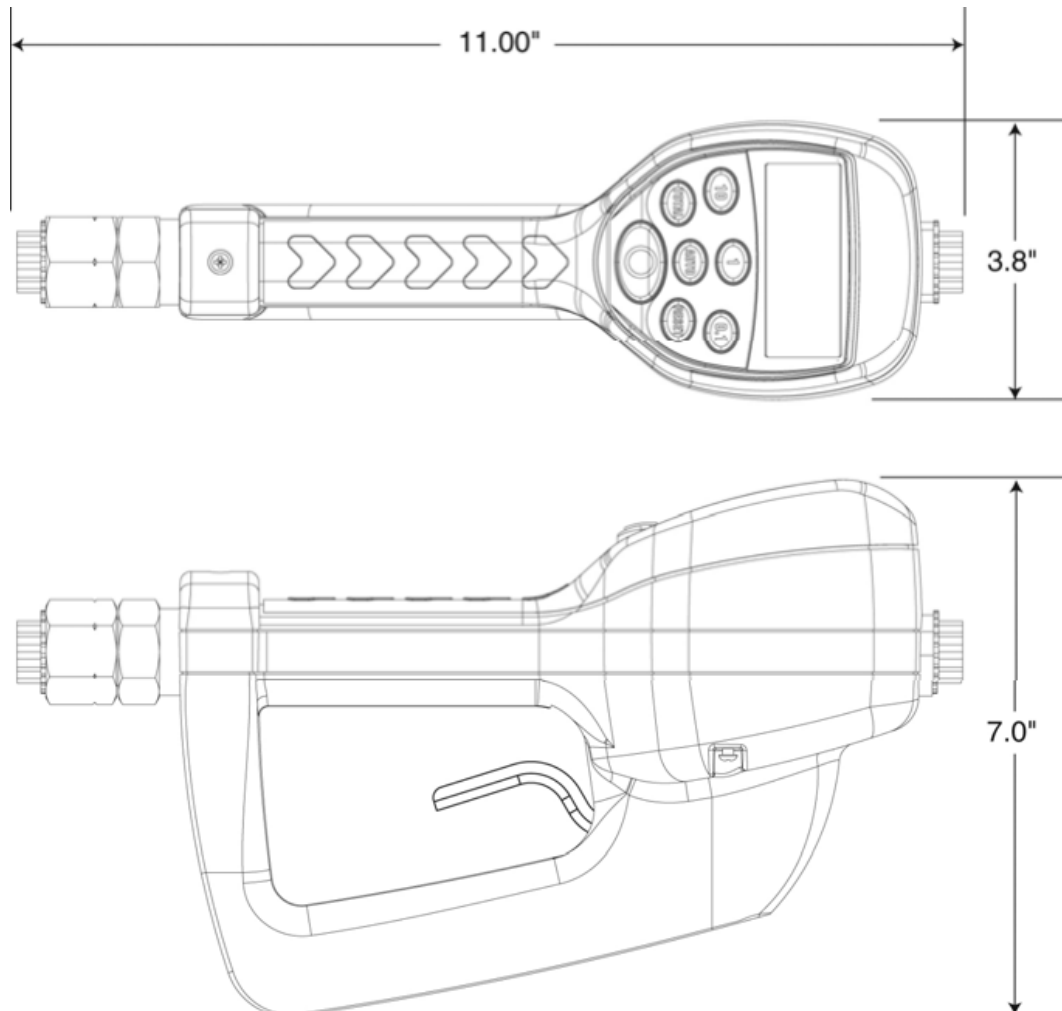
NOTE: When NOT in programming mode, you can view the Power Level by holding down the **TOTAL** button while pressing the **1** button.

Saving Changes

To save your changes and exit the programming mode:

1. Press and hold down the **TOTAL** and **AUTO** buttons at the same time. The display will flash 3 times and go blank.
2. Press the **RESET** button to turn on the display.

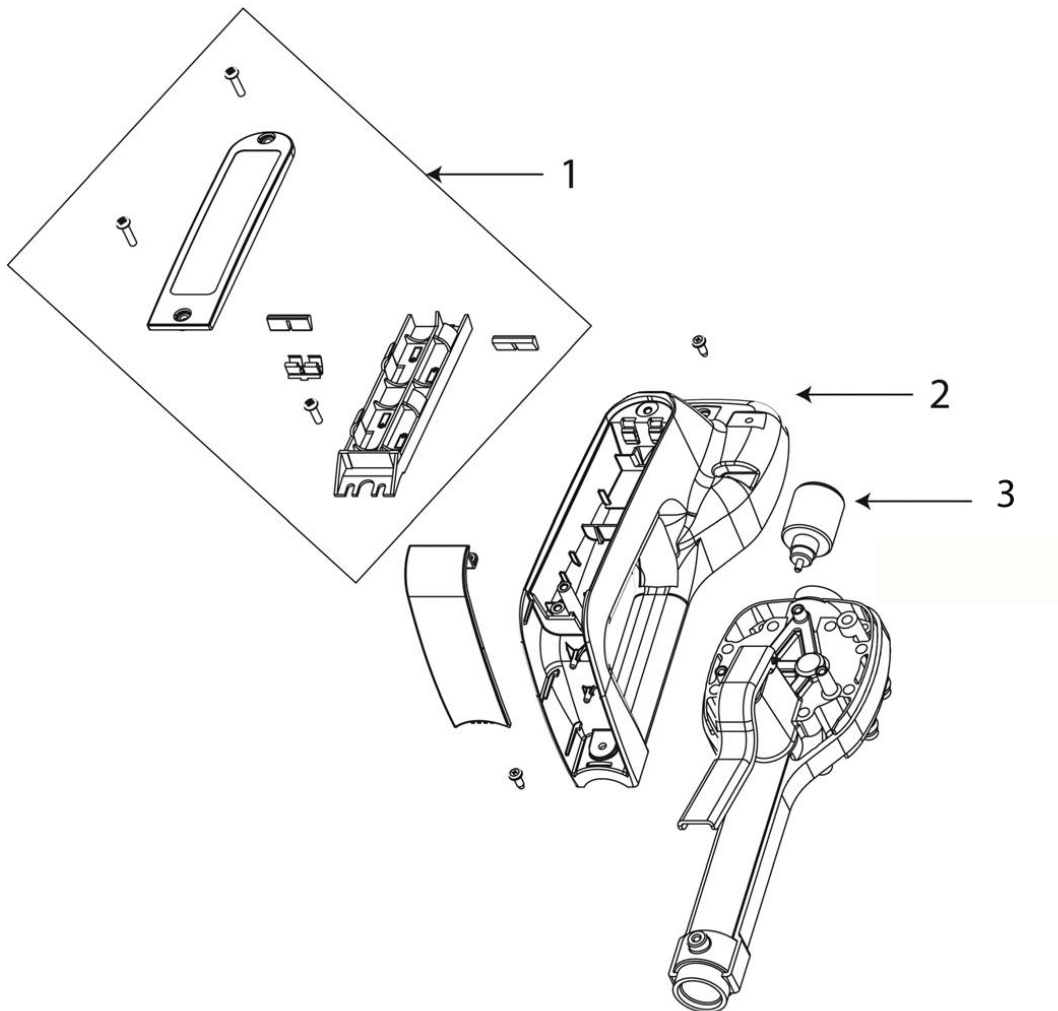
DIMENSIONS



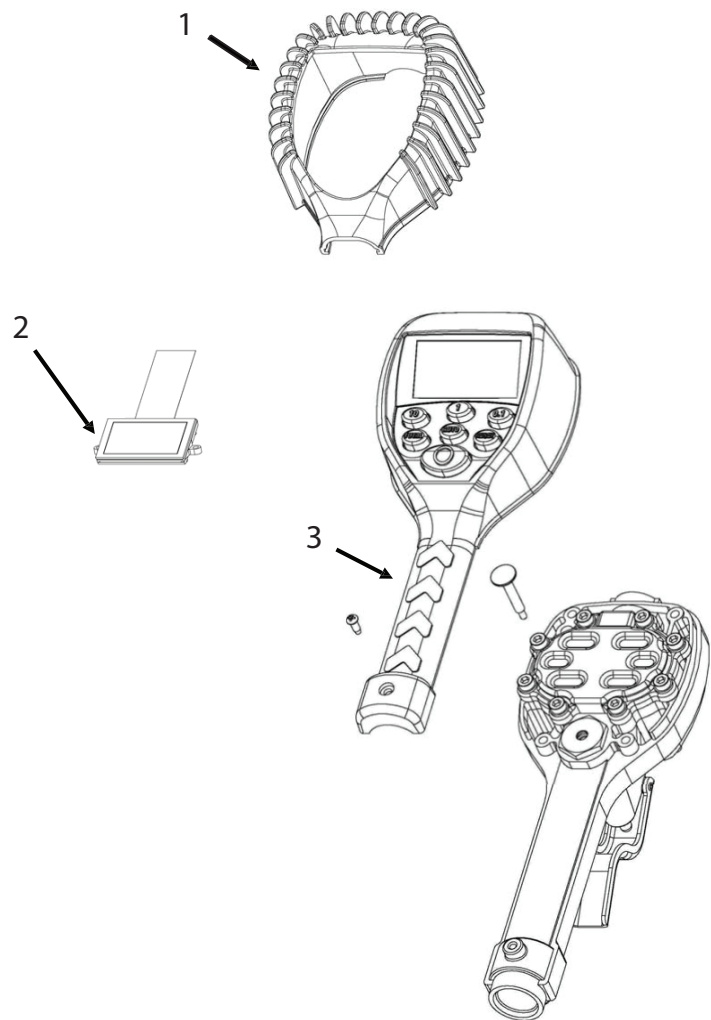
SPECIFICATIONS

Maximum Flow *	10 gpm (38 lpm)
Minimum Flow *	0.25 gpm (1 lpm)
Operating Pressure (Maximum)	1000 psi (67 bar)
Operating Pressure (Minimum)	5 psi (0.35 bar)
Operating Temperature (Maximum)	120° F (50° C)
Operating Temperature (Minimum)	20° F (-5° C)
Accuracy – Oils	+/- 0.5% (+/- 0.5%)
Accuracy – Anti-freeze	+/- 1.5% (+/- 1.5%)
5-Digit LCD Display, 10 mm high x 5 mm wide	Quarts (liters), pints, gallons
Inlet and Outlet Connections	1/2" NPT (1/2" BSPP)
* Tested with DTE-25 motor oil at ambient temperature. Minimum/maximum flow range will vary with fluid viscosity.	

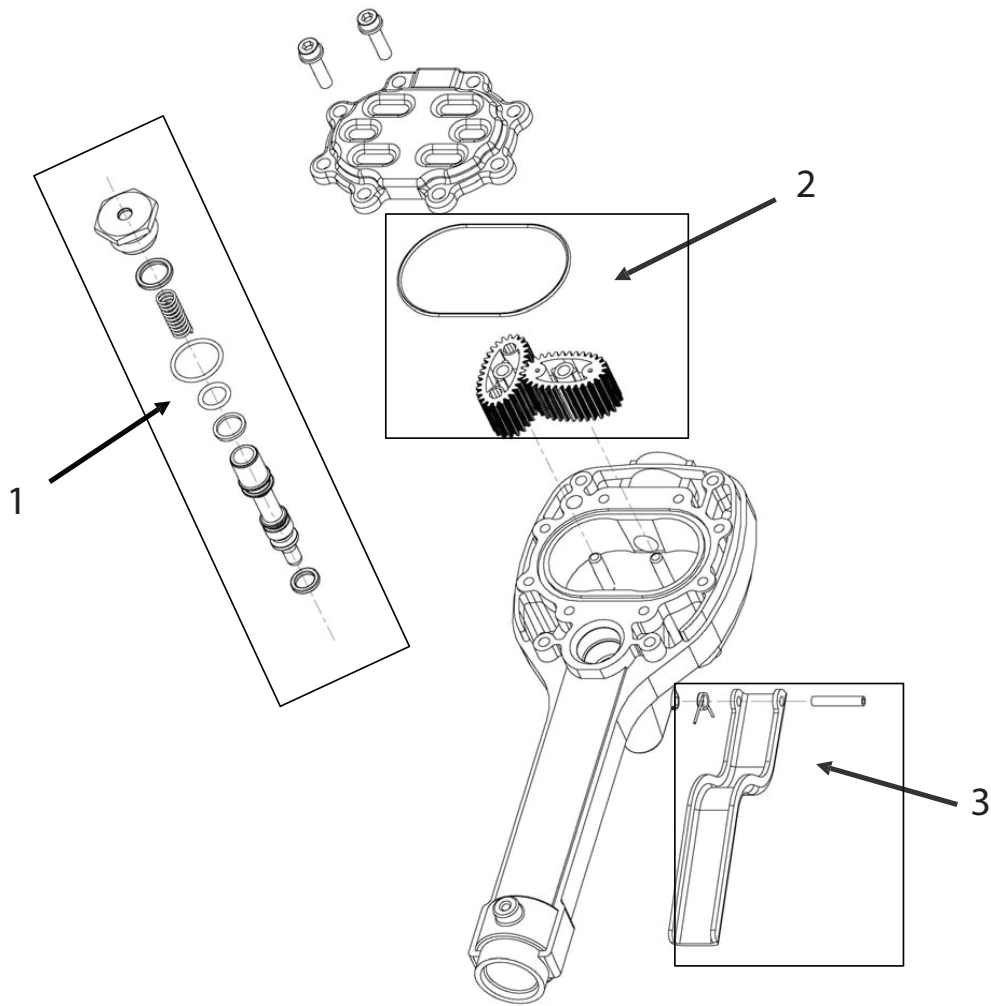
PARTS LIST



Item #	Description	Part Number
1	Battery holder assembly	64103-026
2	Bottom case with screws and radio	64103-029
3	Solenoid	64786-002



Item #	Description	Part Number
1	Rubber boot	65546-001
2	Display assembly	64103-023
3	RF register assembly	64103-030
Not Shown	Swivel, NPT AFLAS	64082-007



Item #	Description	Part Number
1	Valve assembly – AFLAS	64103-020
2	LCP gear set with AFLAS o-ring	62896-003
3	Trigger assembly	64103-015

TROUBLESHOOTING

WARNING

Pressurized Equipment

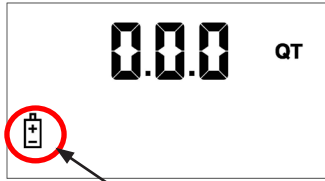
Relieve the pressure prior to checking or repairing the meter. Make sure all valves, controls and pumps are operating correctly.

Symptom	Possible Cause	Remedy
Battery Icon is displayed	Batteries are low	Replace batteries
Display Blank	Meter asleep	Press RESET button
	Loose battery connection	<ul style="list-style-type: none"> Remove battery pack and check battery connection Press RESET button
	Batteries dead	<ul style="list-style-type: none"> Replace batteries Press RESET button
Meter does not latch for batching	Meter not in AUTO mode	Press AUTO button and program batch size
	Meter not reset after prior batch	Press RESET button
	Low batteries	<ul style="list-style-type: none"> Check for battery icon Replace batteries Press RESET button
Slow or no fluid flow	Filter is clogged	Clean or replace the filter in the swivel nut
	Pump pressure is low	Turn up the pump pressure
	Foreign material is jamming meter	Contact your local distributor for repair
Meter inaccurate	Scale factor not correct for fluid	Enter program mode, check and reset program factor

MAINTENANCE

Low Battery Indicators

When the batteries need changing, a progression of warnings appears on the meter screen.



Low Battery Icon

First Warning

The Low Battery icon appears in the lower left corner of the display. That means the batteries are low and need to be changed when the icon appears.

Second Warning

The Battery icon flashes. The battery power is too low and meter functions are disabled.

Changing the Batteries

The battery compartment is located in the lower case on the backside of the trigger guard.



1. Position the unit face down.
2. Unscrew the two screws. Remove the battery door to expose the batteries.
3. Replace the old batteries with 4 AA alkaline batteries.

NOTE: Battery polarity markings are inside battery compartment.

4. Dispose of used batteries properly, according to local regulations.

NOTE: Changing the batteries does **not** affect any of the programmed values or totals.

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